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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/511,912	02/23/2000	Tatau Nishinaga	JEL 31015	4100

7590 02/13/2003

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EXAMINER

ANDERSON, MATTHEW A

ART UNIT	PAPER NUMBER
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1765

22

DATE MAILED: 02/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/511,912

Applicant(s)

NISHINAGA, TATAU

Examiner

Matthew A. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 7-10 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 11-18 and 20-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Newly submitted claim 19 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: YBCO is from neither of the elected species A or B. The applicant has not identified YBCO as being a member of either group.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 19 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

The examiner notes that claims 20-23 are

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6, 11-17, 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (6,377,596 B1) in view of Tokunaga et al. (US 5,425,808) and Nakamura et al. (JP 01-234389A).

Tanaka et al. discloses a method of lateral epitaxial overgrowth of nitride semiconductors (i.e. III-V compound semiconductors such as GaN and alloys). In Fig. 3 the method is shown. A substrate of single crystal sapphire (1) has an amorphous insulating layer of SiO_2 , Si_3N_4 (SiN_x), $\text{SiO}_2\text{:P}_2\text{O}_5$ (PSG), SiON , or Ta_2O_5 is grown on the substrate and then patterned. Nitride semiconductor material is grown epitaxially up out of the pattern and laterally over it (Figs. 3C-3E). Alternative substrates are given in col. 32 lines 35-37 as GaAs, InP, InAs, GaSb, GaP, GaAsP, or GaInAs.

Tanaka et al. does not use MBE as the method of nitride semiconductor growth.

Tokunaga et al. discloses prior art in which GaAs (a known III-V semiconductor compound) is laterally overgrown on an amorphous SiO_2 or Si_3N_4 film. (col. 2 lines 14-29). Tokunaga et al. suggests the equivalence of MBE (molecular beam epitaxy) and CVD (chemical vapor deposition for growth of epitaxial films. (col. 1 lines 30-35, and col. 7 lines 15-24. Additionally, the use of such method to grow other III-V compounds (such as GaN) was also suggested in col. 7 lines 1-25.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references above because Tokanaga et al. suggests an equivalent method of growing selective epitaxial nitride films upon amorphous masking layers thus increasing process flexibility.

The above combination does not suggest the angle of incidence required by the claims.

Nakamura et al. discloses a molecular ray method of performing epitaxy with Ga, Al, and As. Nakamura et al. discloses optimization of the angle of incidence between the substrate and the molecular ray (i.e. beam). The angle can be optimized between 0-90 degrees.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine Nakamura et al. with the previous combination because Nakamura et al. discloses optimization of the angle of incidence between the substrate and the molecular ray (i.e. beam) in order to positively affect the product. The motivation for combining would be the optimal crystal thereby formed.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the incident angle between the substrate surface and the beam during lateral overgrowth of a single crystalline film on a patterned insulating amorphous film which lies on a single crystalline substrate from the exposed seed substrate because such is suggested by the combination of references, such optimization would have been achieved with only routine experimentation, and such optimization would have anticipated results.

In regard to claim 11, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form linear openings in the amorphous film of a certain width because these limitations would have been obvious design choices based on Tanaka's figures and description.

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In regard to claim 14, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a single crystalline film with a defect density not more than 10^4 cm^{-2} because such is directly suggested in Tanaka et al. as possible with such an overgrowth method. (see col. 6 lines 1-10)

In regard to claims 15-16, it would have been obvious to one of ordinary skill in the art at the time of the present invention to grow films with lattice constants different from the substrate because Tanaka et al. suggests GaN can be grown on sapphire substrates which have an inherent and distinct lattice constant.

In regard to claim 17, it would have been obvious to one of ordinary skill in the art at the time of the present invention that the single crystalline substrate be of a material different than that of the beam used because Tanaka used a sapphire (Al_2O_3) single crystalline substrate and grew GaN thereon by ELO. Thus, the substrate material and the beam material may be different according to Davis.

In respect to claim 18, it would have been obvious to one of ordinary skill in the art at the time of the present invention to grow a single crystalline film epitaxially on a surface of a substrate which has a different molecular structure and is not an alloy of the single crystalline film grown thereon because Tanaka et al. grows epitaxially GaN on a sapphire substrate.

In respect to claim 20-23, it would have been obvious to one of ordinary skill to use GaAs as the single crystalline film and sapphire as the single crystal substrate because sapphire or GaAs substrates were known by Tanaka for use in selective epitaxy of III-V semiconductors of which GaAs and GaN are well known examples.

In respect to claim claims 21,22

Response to Arguments

Applicant's arguments filed 12/12/2002 have been fully considered but they are not persuasive.

First, the examiner will respond to the remarks of paper #21 Supplemental Amendment.

The argument that the references fail to disclose the substrate and single film combinations of the claims is not convincing. The rejection is made above. Sapphire and GaAs substrates are disclosed. Epitaxy of III-V semiconductors including GaAs and GaN was also disclosed or suggested.

Second, the examiner will respond to the Declaration filed 12/12/2002 as paper #20.

The argument that CVD and MBE are radically different and non-interchangeable is noted. The examiner notes the suggestion of Tokunaga et al. to use MBE to selectively grow III-V group semiconductor film instead of the MOCVD method detailed in the reference. The examiner does note the need to optimize process parameters when changing methods of deposition.

Third , the examiner will respond to the Amendment of paper #19.
The examiner notes the Declaration and the suggestions of Tokunaga above.

The 'may not' of the Declaration shows the indefiniteness of the argument on page 3 of paper #19. The examiner must standby his reference which suggests MBE as an alternate route of depositing III-V materials epitaxially.

The argument that the angle of incidence claimed is different from that of the Nakamura reference is not convincing. Nakamura shows in Figs 1 and 2 the change of beam intensity (Fig. 1) and the deposition rate (Fig. 2) as a function of incidence angle. Angles from 0-40' are shown as well as other angles up to 90'. The applicant has not provided any evidence that their 0-40' somehow provides an unexpected result as compared to the MBE of Nakamura.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Tokunaga et al. provides motivation to employ MBE interchangeably with CVD as described above as increased process flexibility. The examiner points to col. 7 lines 15-40.

The arguments concerning claim 19 are moot as the claim has been withdrawn from consideration as detailed above.

Conclusion

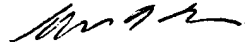
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3599 for regular communications and (703) 305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA
February 12, 2003


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